Dubuque, Iowa: floating ice in river 12th, 13th, 18th; the river froze over on the 27th. La Crosse, Wis.: floating ice in river 11th to 14th, 17th to 20th; the river froze over on the 21st; it opened again on the 23d, and navigation, which had been interrupted since the 21st, was resumed; floating ice in river on the 26th; it froze over again on the 27th, when navigation closed for the season. Saint Paul, Minn.: the river was gorged by ice during the night of the 14–15th a short distance below the landing at the foot of Jackson street; the ice dam increased gradually up to the 22d, at which time it had reached the Jackson street landing.

Missouri River.—Omaha, Nebr.: floating ice in river 2d, 3d, 4th, 18th. Bismarck, Dak.: navigation closed on the 2d.

Saint Mary's River.—Sault de Sainte Marie, Mich.: the locks in the canal were closed on the 3d, and navigation suspended at this place and Lake Superior point.

Little Arkansas River.—Wichita, Kans.: the river froze over on the 20th.

FLOODS.

Harrisburg, Pa.: owing to the heavy rains which fell during the storm of the 17–18th the Susquehanna River rose very high, flooding lowlands.—*Report of Signal Service observer.*

HIGH TIDES.

Key West, Fla., 4th; Southport, N. C., 23d. Provincetown, Mass., 8th: the tide was unusually high during the past week.—*Report of New England Meteorological Society.* Eastport, Me.: high tides occurred from the 3d to the 7th; the highest tide previously noted occurred in 1869; on the 5th of the present month it rose five inches higher than in 1869, overflowing several of the wharves; the wind was light at the time and little damage was caused.—*Report of Signal Service observer.* Asbury Park, N. J.: the severe wind storm on the morning of the 11th caused the tide to rise very high, entirely destroying a number of the cottage bulk-heads at Monmouth Beach, which were partially torn out by a storm two weeks ago.—*The New York Sun, December* 12.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Faint auroral displays were reported as far south as Clayton and Egg Harbor City, N. J. To the westward of the Atlantic coast states no auroras were observed south of the forty-fourth parallel, and none were noted at stations in the Lake region. They were most frequently reported at Saint Vincent, Minn., and were seen on from one to three dates at stations in Dakota and northeastern Montana.

The most notable display of the month occurred at Saint Vincent, Minn. "It was first observed at 11 p. m., 23d, as an irregular, diffused light; at 11.30 p. m. a distinct arch had formed which rose to about altitude 40° and covered about 160° azimuth."—*Report of Signal Service observer.*

Auroras were observed during the month as follows: 1st, Clayton, N. J. 3d, Spring Lake, Dak.; Saint Vincent, Minn. 4th, Fort Sully and Spring Lake, Dak. 5th, Fort Buford and Fort Sully, Dak. 7th, Saint Vincent, Minn. 8th, Fort Buford, Dak.; Poplar River, Mont. 23d, Fort Totten, Dak.; Saint Vincent, Minn.; Wedgewood, N. Y.; Eagle's Mere, Pa. 24th, Fort Totten, Dak.; Saint Vincent, Minn. 25th, Davenport, Dak.; Saint Vincent, Minn. 26th, Egg Harbor City, N. J. 29th, Orono, Me.; Saint Vincent, Minn. 30th, Fort Assinaboine, Mont.

THUNDER-STORMS.

Thunder-storms were reported during the month, by states and territories, as follows: 2d, 1; 3d, 1; 8th, 9th, 12th, and 13th, 1; 14th, 2; 15th and 16th, 4; 17th, 1; 22d, 2; 23d, 4; 24th, 2; 25th and 26th, 3; 27th, 2; 29th, 1; 30th and 31st, 2. None were reported on the 1st, 4th to 7th, 10th, 11th, 18th to 21st, and 28th.

Thunder-storms were reported in the several states and territories, by days, as follows: Ariz., 5; Ark., 1; Cal., 1; Fla., 2; Ga., 1; Ind T., 2; Kans., 1; La., 6; Md., 1; Miss., 1; Mo., 5; Nebr., 1; N. J., N. M., N. Y., 1; Tex. 8. In Ala., Colo., Conn., Dak., Del., D. C., Idaho, Ill., Ind., Iowa, Ky., Me., Mass., Mich., Minn., Mont., Nev., N. H., N. C., Ohio, Oregon, Pa., R. I., S. C., Tenn., Utah, Vt., Va., Wash. Ter., W. Va., Wis., and Wyo. no thunder-storms were reported.

Thunder-storms were reported in the greatest number of states and territories (4) on the 15th, 16th, and 23d.

They were reported on the greatest number of days (8) in Texas. In Louisiana they were noted on six, and in Arizona and Missouri on five days.

MISCELLANEOUS PHENOMENA.

PRAIRIE FIRES.

Bismarck, Dak., 9th: large prairie fires are raging seven miles northwest of station; nearly 1,000 acres of pasture have been burned over, and about sixty tons of hay and one ranch building consumed. Prairie fires also occurred to the east of station on the 22d.

Prairie fires also occurred on the following dates: Fort Buford, Dak., 1st; Parkston, Dak., 23d; Fort Sill, Ind. Ter., 1st, 2d, 3d, 10th to 13th.

HALOS.

Solar halos were most frequently noted in California and Illinois, where they occurred on twelve days. In Indiana they were reported on ten days; in Ariz., Fla., Iowa, Md., Mass., N. J., N. Y., Ohio, Oreg., Tenn., Tex., Vt., and Wis. on from five to nine days. None were reported in Ala., Colo., Del., D. C., Idaho, Me., Miss., Mo., Nev., N. Mex., R. I., Utah, W. Va., and Wyo. They were reported in the greatest number of states and territories, twenty, on the 7th; in twelve on the 11th, and in eleven on the 8th. On the 3d, 5th, 10th, 13th to 16th, 25th, 26th, and 31st they were noted in from five to ten states and territories. The 2d was the only day on which solar halos were not observed in some portions of the country.

Lunar halos were most frequently reported in California and Tennessee, where they were observed on twelve dates. In Indiana they were noted on ten dates, while in Ala., Ariz., Dak., Iowa, Kans., Ky., La., Md., Mich., Minn., Mo., Mont., Nebr., Nev., N. J., N. Y., Oregon, Pa., S. C., Tex., and Va. they were reported on from five to nine dates. None were reported in Ark., Del., and R. I. They were reported in the greatest number of states and territories, twenty-seven, on the 11th; in twenty-three on the 12th, and in twenty-one on the 15th. On the 7th, 9th, 10th, 13th, 16th, 18th, 19th, and 26th they were reported in from ten to twenty states and territories. On the 1st, 2d, 28th, and 31st no lunar halos were observed.

REMARKABLE LUNAR HALO.

The following description of a remarkable lunar halo has been received from Prof. E. A. Hallett, of Borden Institute, New Providence, Ind.: "December 11th, 10 p. m.—At 8.43 p. m. (ninetieth meridian time), I noticed a bright circle passing through the moon in its southern side, and extending about

80° or 90° northward, making our position exactly in the centre of the circle. At the same time there was an ordinarily bright halo around the moon. This large arch was plainer than the halo and was plainest where it was clearest of clouds. There were a few hazy clouds, and at times they encroached upon the circle and made it fade, but it returned as the haze blew away. Occasionally bright spots came into the perimeter to last a few moments only. It seemed to become a very little smaller after some five or six minutes. In fifteen minutes it was gone, but the halo around the moon remained. The cloudiness remained about the same."

METEORS.

The distribution of meteors, by dates, was as follows: 1st, Matanzas, Fla. 2d, Lansing, Mich.; Beverly, N. J. 3d, Harrisonville, Mo. 4th, Fort Sully, Dak.; Pontiac, Mich. 5th, Pontiac, Mich.; Palo Alto, Miss. 6th, Vevay, Ind. 7th, Nashua, N. H. 9th, Tremont, Mich. 10th, Vevay, Ind.; Yates Centre, Kans.; Protem, Mo. 12th, Keeler, Cal.; Woonsocket, Dak.; Barren Creek Springs, Md.; Cedar Springs, S. C. 13th, Cairo, Ill. 14th, Holyoke, Mass.; Beverly, N. J. 19th, Princeton, Mo. 20th, Little Rock, Ark.; Middlebrook, W. Va. 22d, Tremont, Mich.; Protem, Mo. 23d, New Market, Ala.; Fox Creek, Mo. 24th, Providence, Mass.; Palo Alto, Miss. 27th, Matanzas, Fla. 28th, Orono, Me.; Ypsilanti, Mich.; Beverly, N. J. 29th, Dale Enterprise, Va. 30th, Clinton, Iowa; Barren Creek Springs, Md.; Beverly, N. J. 31st, Glenwood, Iowa; Bendena and Yates Centre, Kans.; Protem, Mo.

The following are more notable meteoric displays reported:

Lead Hill, Boone Co., Ark.: a large, bright meteor was observed in the northeastern sky at 4.55 a. m., 2d. It moved toward the northwest, and when near the horizon broke into two parts; the meteor left a trail of light in its wake.

Cape Henry, Va.: several small meteors were observed on the 6th; one large one, noted in the northeast at 7 p. m., moved horizontally in a westerly direction and exploded after a flight of five seconds, its colors being red and violet.

Orono, Me.: a brilliant meteor was observed passing across the northwest sky at 5.05 p. m., 28th; it left a long train of light in its passage.

Willow, Colusa Co., Cal.: a meteor was observed at 10.45 p. m., 29th; it passed slowly from near the zenith south-southeastward and disappeared below the horizon; duration of passage about six seconds.

MIRAGE.

Mirage were observed as follows: Yuma, Ariz., 1st; San Diego, Cal., 5th; Kimball, Dak., 1st, 3d, 28th; Webster, Dak., 30th, 31st; Woonsocket, Dak., 3d, 29th, 30th, 31st; Hampton, Iowa, 8th, 29th; Hay Springs, Nebr., 14th; Brady, Tex., 11th; Cape Henry, Va., 25th.

SUN SPOTS.

Prof. F. P. Leavenworth, director, Haverford College Observatory, Pa. (observed by Mr. H. V. Gummere, assistant):

Date. December, 1888.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 3 p. m ...	0	0	0	0	0	0	1	13	0	0	Definition poor.
4, 10 a. m ...	0	0	0	0	0	0	1	9	2	4	Definition good.
5, 13 m	0	10	0	0	0	0	1	19	7	14	Definition very good.
6, 10 a. m ...	0	0	0	0	0	0	1	5	5	9	Definition good.
7, 12 m	0	0	0	0	0	0	1	1	1	13	Definition very poor.
8, 9 a. m ...	0	2	0	0	0	0	1	3	4	27	Definition fair.
12, 11 a. m ...	0	0	1	3	0	0	0	0	2	7	Definition poor.
13, 11 a. m ...	0	0	0	0	0	0	0	0	3	4	Definition good.
14, 11 a. m ...	0	0	0	0	0	0	0	0	0	0	Definition very poor.
15, 11 a. m ...	1	11	0	0	0	0	1	11	3	11	Definition good.
19, 3 p. m ...	0	5	0	0	0	0	1	16	3	4	Definition good.
20, 12 m	0	1	0	0	0	0	1	17	.....	.....	Definition poor; too misty for faculae.
21, 11 a. m ...	0	0	0	0	0	0	1	8	5	19	Definition good.
22, 10 a. m ...	0	0	1	8	0	0	0	0	0	0	Definition very poor.
24, 11 a. m ...	1	1	0	0	0	0	1	1	7	20	Definition very good.
25, 12 m	0	0	0	0	0	0	0	0	6	21	Definition very good.
26, 12 m	0	0	0	0	0	0	0	0	2	4	Definition poor.
28, 11 a. m ...	0	0	0	0	0	0	0	0	8	15	Definition good.
29, 11 a. m ...	1	1	0	0	0	0	1	1	9	23	Definition good.

Mr. John W. James, Riley, McHenry Co., Ill.: one of the large spots (seen near e. edge November 27th) vanished December 4th, when two days past sun's meridian; the other estimated 29,000 miles diameter disappeared, by the solar rotation, 7th, but failed to reappear, when due, on e. edge, 19th; a group of small spots two days from w. edge disappeared 21st, and none seen the rest of the month.

Mr. H. D. Gowey, North Lewisburgh, Champaign Co., Ohio: sun spots were observed on the 4th and 5th.

SAND STORMS.

Sand storms were reported as follows: Little Rock, Ark., 20th; Dodge City, Kans., 2d, 14th, 15th, 22d, 23d.

VERIFICATIONS.

INDICATIONS FOR 24 HOURS IN ADVANCE.

Percentages of indications verified, December, 1888.

States.		States.	
Maine	80.6	Tennessee	86.8
New Hampshire	82.4	Kentucky	84.0
Vermont	80.8	Ohio	76.6
Massachusetts	85.2	West Virginia	82.7
Rhode Island	83.5	Indiana	81.4
Connecticut	84.7	Illinois	82.1
Eastern New York	79.7	Lower Michigan	81.7
Western New York	79.7	Upper Michigan	78.8
Eastern Pennsylvania	85.5	Wisconsin	85.1
Western Pennsylvania	73.9	Minnesota	84.1
New Jersey	87.7	Iowa	86.7
Delaware	90.7	Kansas	89.0
Maryland	89.0	Nebraska	85.8
District of Columbia	89.1	Missouri	83.5
Virginia	86.6	Colorado	88.0
North Carolina	90.7	Dakota	82.4
South Carolina	91.7	Southern California*	90.7
Georgia	91.8	Northern California*	84.4
Eastern Florida	82.3	Oregon*	73.5
Western Florida	83.5	Washington Territory*	77.4
Alabama	87.2	*By elements:* Weather	87.3
Mississippi	83.5	Temperature	80.2
Louisiana	82.8		
Texas	83.1	Monthly percentage of weather and temperature combined†	84.5
Arkansas	87.3		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

The percentages of verifications of the 8 p. m. daily indications for December, 1888, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for districts east of the Rocky Mountains for December, 1888, were made by Assistant Professor H. A. Hazen, and those for the Pacific Coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Assistant Professor C. F. Marvin.

CAUTIONARY SIGNALS FOR DECEMBER, 1888.

Statement showing percentages of justifications of wind signals and cold-wave signals for the month of December, 1888:

Wind signals.—(Ordered by Assistant Prof. H. A. Hazen.) Total number of signals ordered, ninety-two; justified as to velocity, wholly, fifty-nine, partly, thirteen; justified as to direction, eighty-seven. Number of cautionary signals ordered, sixty; justified, wholly, thirty-five, partly, seven. Number of